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which is discharged from the human body, separate the seeds from it, and roast, grind and eat them, making merry over their loathsome meals, which the Spaniards therefore call the second harvest of the Californians." See Smithsonian Report, 1865, p. 365. Baegert's book was published at Mannheim, 1773.

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LIFE AND NATURE IN SOUTHERN LABRADOR.

BY A. S. PACKARD.

(Continued from p. 275 March number.)

AFTER roaming over the island and making pretty full collections of the insects, we paid attention to the marine zoölogy. Shore collecting is not as remunerative in Labrador as on the Maine and Massachusetts coasts. The most noticeable form is the six-rayed starfish (*Asteracanthion polaris*) which sometimes measured twenty inches from tip to tip of its opposing rays; its color was a dirty yellowish white, not red as in the common fire-finger, also abundant. The polar starfish is common in Greenland, and is a truly arctic form.

The common crab (*Cancer irrorata*) frequently occurred under stones, but the lobster was neither seen nor heard of; though common on the southern shores of Newfoundland it does not reach north into the Straits of Belle Isle. Among the worms which occurred at low water mark was the Pectinaria. On the New England coast it only occurs in deep water below tide mark.

Dredgings were first made at the mouth of Salmon river, a few rods from shore, in some eight fathoms of water in a firm deep mud. The most characteristic shells were gigantic *Aphrodite greenlandica*, large cockles (*Cardium islandicum*), as well as the pelican's foot (*Aporrhais occidentalis*), which occurred of good size and in profusion. In the soft mud occurred multitudes of the neat little sand star (*Ophioglypha nodosa*). Another form dredged on rocky bottom was *Cynthia pyriformis*, or the sea peach, and large specimens were cast up by the waves on the beach. Every spare day was given to dredging, and having been deeply interested in marine zoölogy by the writings of Gosse, in England, and of Stimpson in this country, and having obtained a good idea of the local marine fauna of Casco bay, in Maine, it was with no little interest and expectation that we dropped the

dredge in arctic waters, and we were not a little delighted with the result of finding so near shore and in such shallow water, forms which off the coast of Maine, in deep water, were rare and usually but half grown.

July 25th a party of us rowed up Salmon bay and went a mile up the river. The tide was out and we looked for the fresh-water mussel (*Alasmodon arcuata*), which is our northernmost species, and inhabits the rivers of Southern Newfoundland. We could find none, although the settlers told us that mussels, clams and "oysters" were common enough in the river. But something better was discovered. We found traces of genuine Quaternary marine sands and clays containing fossils. There were several banks of sand and clay along the edges of the river. In the latter I found *Aphrodite groenlandica* and *Aporrhais occidentalis*, with *Buccinum undatum*. They had been washed out of the clay into the bed of the river, and were collected at low water. I also dug several inches into the clay bank and found the disintegrated shells of the *Aphrodite*, so as to leave no doubt but that the shells were fossils. Down at the mouth of the stream at the head of the bay, on the flats, I found several *Buccinum undatum*, and quite a number of *Aporrhais*, young and old, broken and entire. On each side of the river was a terrace of sand and clay, with a thick growth of alders and willows, with the fire-weed (*Epilobium angustifolium*), the golden rod and a large cruciferous plant common in the mountainous parts of New England; also *Comarum palustre*, and a *Thalictrum*. Farther back and mostly lining the banks was a dense growth, impossible to penetrate save occasionally where there was a break in the thicket of spruce and a birch, perhaps *Betula populifolia*. Still farther up and away back stretched the bare moss-covered hill tops, the summer resort of deer and caribou. Here we saw a ptarmigan. But this was one of our halcyon days, of which there were few, as the last two weeks of July were stormy and wet. The clear fair-weather winds were from the south-west; the south-east winds brought in the fog and rain, while the northerly winds brought a few curlew, the advance guard of the hosts which were to arrive early in August.

The 3d of August was a fine day. A party of us went up the Esquimaux river to Mrs. Chevalier's, whose husband, now dead, entertained Audubon when visiting this coast. The sail up the

river was a pleasant one. It was about three miles from its mouth to an expansion of the river, on whose shores were four or five winter houses. Although most of the settlers live on the coast through the year, some have their winter and summer houses. Those who live up the interior, sometimes a distance of seventy miles from the coast, where there is wood and game, move from the shore about the 20th of October. They spend a month in cutting wood, a family burning through the winter about thirty cords. Then succeeds a month of hunting and trapping. The snow does not come, we were told, until the last of December, although we should judge this to be an extreme statement, and the snow is not usually more than three feet deep. The people profess to like the winter better than the summer. They shoot deer, foxes, &c., black fox being sometimes secured, whose skin is worth between two and three hundred dollars. Grouse are abundant, a good hunter securing from sixty to seventy a day in favorable seasons. At any rate fresh meat is obtained for each family two or three times a week.

The houses are small, built of wood, boarded and shingled, seldom constructed of logs, and are heated by peculiar stoves, great square structures resembling Dutch stoves, and heating the whole house, the two living rooms opening into each other, the stove being placed partly in each.

The French residents at the Mecatina islands, more social and gayer than the phlegmatic English settlers about the mouth of the Esquimaux and Salmon rivers, spend the winter evening in dancing and other gayeties to which the Anglo-Saxon, in Labrador at least, is a comparative stranger.

The Esquimaux river at its eastern entrance is but a few rods wide. Passing Esquimaux island we sailed out into a broad bay or expansion of the river, with ravines leading down to it, and under the steep bank protected from the northerly winds were the winter houses previously described. Up the river, just beyond Mrs. Chevalier's, the river contracted into narrows with rapids; it then opened into another bay or expansion two miles wide, the river being a succession of lakes connected by rapids, and this is typical of the rivers and streams of the Labrador peninsula. A barge cannot sail up the Esquimaux river more than fifteen miles, although one can push farther on in a flat boat. We were told that the river is about two hundred miles in length, and although perhaps the largest in Labrador it has never been explored.

Here we met the black flies in full force, and although we had been fearfully annoyed by them in rambling over Caribou island, here they were astounding, both for numbers and voracity. The black fly lives during its early stages in running water. The insect finds nowhere in the world such favorable conditions for its increase as in Labrador, over a third of whose surface is given up to ponds and streams. The insides of the windows of Mrs. Chevalier's house swarmed with these fiends, the children's faces and necks were exanthematous with their bites; the very dogs, great shaggy Newfoundlanders, would run howling into the water and lie down out of their reach, only their noses above the surface. The armies of black flies were supported by light brigades of mosquitoes. No wonder that these entomological pests are a perfect barrier to inland travel; that few people live during summer away from the sweep of the high winds and dwell on the exposed shores of the coast to escape these torments. They are effectual estoppers to inland exploration and settlement.

Accepting our hostess' kind invitation to take dinner, we sat down to a characteristic Labrador midday meal of dough balls swimming in a deep pot of grease with lumps of salt pork, without even potatoes or any dessert; nor did there seem to be any fresh fish. The staples are bread and salt pork; the luxuries game and fish; the delicacies an occasional mess of potatoes, brought down the St. Lawrence once a year in Fortin's trading schooner.

Over the mantelpiece was a stuffed Canada grouse or partridge and a ptarmigan in its winter plumage, but I was most delighted with the gift of some Quaternary fossils with which Mrs. Chevalier kindly presented me, including large specimens of *Cardita borealis*, *Aporrhais occidentalis* and, most valuable of all, the valves of a brachiopod shell, which I had also dredged on the coast in ten fathoms, the *Hypothyris psittacea*. On our return down the river we fished up the valves of the *Pecten magellanicus*, the great scallop shell, which lives in five or six feet of water. This mollusk, which is locally known in Labrador by the name of "pussel," we afterwards obtained in quantity, fried it in butter and meal, finding it to be delicious eating, combining the properties of the clam and oyster, the single large adductor muscle being far more tender than that of the common scallop of Southern New England and New York.

With our man, James Mosier, and his sailboat we spent two days in dredging in from forty to fifty fathoms out in the Straits of Belle Isle, three or four miles from land. The collection was a valuable one, containing some new species. The crown of the bank which we raked with our poorly constructed dredge was packed with starfish, polyzoans, ascidians, shells, worms and Crustacea. The collection was purely arctic, and had not the only dredge I had become broken, we should have reaped, or rather dredged, a rich harvest. As it was, the novelties were quite numerous, and the interest and excitement, as well as labor, of overhauling, sorting and preserving what we did obtain lasted for several days.

The only plant besides stony vegetable growths called "nullipores" dredged at this depth was a delicate red sea-weed, the *Ptilota elegans*, which was found afterwards to extend as far down in depth as ninety fathoms. Those who glibly talk, on *terra firma*, of plant life as affording a basis for animal life, should dredge in deep water. They will find that a vast population of animals of all sorts and conditions in the scale of life is spread at all depths over the sea bottom, thriving almost without exception on one another—on animal protoplasm—and in the beginning of creation animal life was without doubt contemporaneous in appearance with vegetable existence. Indeed, what is the difference in form and structure between a bacterium and a moner? The two worlds of plant and animal life arise from the same base, a common foundation of simplest structure, showing none of the distinctive characteristics of animal or plant life, and only barely earning the right to be called organisms, that vague term we apply for convenience to any, even the simplest structures endowed with life.

Of all the pleasures of a naturalist's existence, dredging has been, to our mind, the most intense. The severe exertion, the swimming brain, the qualms of sea sickness, tired arms and a broken back, the memory of all these fade away at the sight of the new world of life, or at least the samples of such a world, which lie wriggling and sprawling on the deck of the sailboat, or sink out of sight in the mud and ooze of the dredge, to be brought to light by vigorous dashes of water drawn in over the side of the boat. Those days of dredging on the Labrador coast, where there was such an abundance and luxuriance of

arctic varieties, were days never to be forgotten. There is a nameless charm, to our mind, in everything pertaining to the far north, the arctic world, and we can easily appreciate the fascination which leads one back again to the polar regions, even if hunger and frost had once threatened life. Arctic exploration has but begun, and though its victims will yet be numbered by the score, enthusiasts will yet attempt the dangers of arctic navigation, and fresh trophies will yet be won.

Early in August, during the few still clear nights succeeding bright and pleasant days, we had auroras of wondrous beauty, not excelled by any depicted by arctic voyagers.

On the 10th of August the curlews appeared in great numbers. On that day we saw a flock which must have been a mile long and nearly as broad; there must have been in that flock four or five thousand! The sum total of their notes sounded at times like the wind whistling through the ropes of a thousand-ton vessel; at others the sound seemed like the jingling of multitudes of sleigh bells. The flock soon after appearing would subdivide into squadrons and smaller assemblies, scattering over the island and feeding on the curlew berries now ripe. The small snipe-like birds also appeared in flocks. The cloud berry was now ripe and supplied dainty tid-bits to these birds.

By the 18th of the month the golden rods were in flower. Here, as has been noticed in arctic regions, few bees and wasps visit the flowers; the great majority of insect visitors are flies (Muscidæ), especially the flesh fly and allied forms. A bumble-bee occasionally presents himself, more rarely a wasp, with an occasional ichneumon fly, but the two-winged flies, and those of not many species, were constant visitors to the August flowers. The black flies still remained to this date terrible scourges in calm weather, though in cloudy days and at night they mostly disappeared.

Wandering through the fog and drizzle along the mud flats on the northern side of the island I picked up *Aporrhais occidentalis*, *Fusus tornatus*, *Cardita borealis*, large valves of *Saxicava rugosa*, *Buccinum* and *Astarte sulcata* and *compressa*; these and *Pecten islandicus* and other shells forming much the same assemblage as I had dredged a few days previous out in the straits in fifty fathoms. The only recent shells lying about were shallow-water forms, such as the common clam, *Tellina fusca* and the razor

shell. It was evident that here was a raised sea-bottom, and the Quaternary formation. In the afternoon I returned to the spot and dug up many more shells mingled with pieces of a yellow limestone containing Silurian fossils, brachiopods and corals. This horizon, then, represented a deep sea-bottom, over which the open sea must have stood at least 300 feet, while the clay fossils of the mouth of the Esquimaux river must have lived in a deep muddy bay sheltered from the waves and currents of the open sea. The drift deposits of Labrador are scanty in extent compared with those of the Maine coast. They are but isolated patches compared with the extensive beds of sand and clay which compose the Quaternary deposits of New England.

On the 22d August we made our last excursion up the Esquimaux river, going up some six miles from its mouth. From a hill top I could look over the surface of this lake-dotted land. The surface was rugged and bare in the extreme. The river valley, however, was well wooded, the spruce and birch perhaps thirty feet in height. Here and there the river passed through high precipitous banks of sand. The hills were rough, scarred with ravines, precipices, and deep gaps, the syenite wearing into irregularly hummocky hills, the rough places not filled up with drift, and thus the contours tamed down as in New England. Indeed, Labrador at the present day is like New England at the close of the ice period or at the beginning of the epoch of great rivers, before the terraces were laid down and the country adapted for man's residence. Labrador was never adapted for any except scattered nomad tribes. It is still an unfinished land.

While the hills were bare and the rocks covered with the reindeer moss, here and there by the river's edge in favorable, protected places were tall alders and willows, with groups of asters and golden rods. Here I saw a veritable toad, and glad enough was I to recognize his lineaments. I was also told that there were frogs in existence, though we never saw or heard them. There are no snakes or lizards, so that our history of these animals in Labrador will be as brief as that of the Irish historian, but we did find a small salamander at Belles Amours in a later trip to this coast.

On our return we found that a whaler had towed a whale into the mouth of the river and was about to try out the oil. We secured a piece of the flesh, and on reaching camp boiled it; it

was not bad eating, tasting like coarse beef. Seal's flippers we also found not to be distasteful, though never to be regarded as a delicacy.

Dredging and collecting insects on fine days when not too calm filled up the measure of our seven weeks. The time passed rapidly, the days were too short for all the work we planned to do, and it was not without regret that we left the rugged untamed shores of the Labrador. On the afternoon of the very day she had set for her return to Caribou island, the *Nautilus* hove in sight. As she made our harbor she struck upon a sunken rock, tore off a piece of her keel, but slid off and came to anchor as near as practicable to the mission house, and then succeeded the mutual spinning of Labrador and Greenland yarns by the reunited party.

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RECENT LITERATURE.

COPE'S VERTEBRATA OF THE TERTIARY FORMATIONS OF THE WEST.¹—Just ten years ago (1875) a bulky quarto volume on the Vertebrata of the Cretaceous formation of the West, by Professor Cope, appeared, forming the second volume of the memoirs of the Hayden Geological Survey of the Territories. The ponderous volume now before us contains between three and four times as many pages and about fifty more plates. The work is designed to present figures and descriptions of the vast number of species of vertebrates of all classes, but more especially of the mammals of the Tertiary lake-basins of the West. For the first time the palæontologist has before him the materials for a view of that rich fauna which through the Tertiary period crowded the shores of the immense lakes whose sediments form the surface of our Western plains—a fauna whose descendants, vastly less in number though more highly specialized, still survive on this continent.

The subject is naturally the most attractive the palæontologist could have presented to him, since the materials represent a number of extinct orders, suborders and families, which fill more or less completely the wide gaps between the existing orders of mammals, and enable the student to examine the foundations, so to speak, upon which the existing groups have been built up; this, of course, has led not only to the solution of knotty points in classification, but to broader conceptions of the relations of the

¹ *U. S. Geological Survey of the Territories*. F. V. Hayden in charge. The Vertebrata of the Tertiary formation of the West. Book I. By EDWARD D. COPE. Washington, 1883-4. 4to, pp. 1009, with over 100 plates and numerous wood-cuts in the text.